UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/560,567	12/12/2005	Peng Yin	PU030164	6673

24498 7590 04/15/2011

Robert D. Shedd, Patent Operations
THOMSON Licensing LLC
P.O. Box 5312
Princeton, NJ 08543-5312

EXAMINER	
THOMPSON, JAMES A	
ART UNIT	PAPER NUMBER
2625	

MAIL DATE	DELIVERY MODE
04/15/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/560,567	YIN ET AL.	
	Examiner	Art Unit	
	James A. Thompson	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 February 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see page 10, line 10 to page 13, line 4, filed 28 February 2011, with respect to the rejections of claims 1-24 and 37 under 35 U.S.C. § 101 have been fully considered and are persuasive. The rejections of claims 1-24 and 37 under 35 U.S.C. § 101 have been withdrawn.

2. Applicant's arguments, see page 13, lines 5-13, filed 28 February 2011, with respect to the rejections of claims 26, 28-31 and 34 under 35 U.S.C. § 112, second paragraph have been fully considered and are persuasive. The rejections of claims 26, 28-31 and 34 under 35 U.S.C. § 112, second paragraph have been withdrawn.

3. Applicant's arguments filed 28 February 2011 have been fully considered but they are not persuasive.

Examiner initially notes, as has been stated in previous office actions, that only one of the four steps recited in claim 1, only one of the four means recited in claim 13, and only one of the four steps recited in claim 25, need be taught by Kondo to demonstrate that Kondo anticipates claims 1, 13 and 25, respectively.

Applicant argues [see page 13, line 14 to page 17, line 2 of Applicant's arguments] Kondo (US-2004/0218674) does not teach the first recited step since paragraphs 46-48 allegedly

do not teach selectively checking the modes in response to motion vector information of checked first modes.

Examiner replies Kondo discusses, in paragraphs 46-47, checking five coded pictures and whether the B picture is to be used to encode other pictures. Only two of the five coded pictures can be used for coding, assuming one of the inter-coding modes is selected for the macroblock. The checking is performed for the purpose of coding each macroblock. Thus, first modes for a subset of macroblock modes are checked. Kondo then discusses in paragraph 48 how other modes are checked for coding the macroblocks based on the motion vector. Thus, the limitation "selectively checking other modes in response to motion vector information of the checked first modes" is taught by Kondo. Finally, Kondo discusses in paragraph 49, lines 1-11 (also cited in the corresponding portion of the previous action mailed 04 January 2011) selecting the coding mode for the macroblocks. Since the coding is based on the above selective checking, "selecting the mode for the current macroblock in response to the checked modes" is taught by Kondo.

Only one of the four recited steps of claim 1 need be taught by Kondo in order for Kondo to anticipate claim 1. Thus, the reasons set forth above are sufficient to establish that Kondo fully anticipates claim 1.

Applicant argues [see page 17, line 3 to page 18, line 16 of Applicant's Arguments] Kondo does not teach the recited step of "checking the macroblock mode of at least one neighboring macroblock, and selecting the mode for the current macroblock in response to the macroblock mode of the at least one checked neighboring macroblock" as recited in claim 1.

Applicant contends the motion vector taught by Kondo is not a macroblock mode and refer only to the same picture.

Examiner replies that paragraphs 53-54 and paragraph 57, lines 1-4 of Kondo, cited in the previous office action, teaches that the motion vectors of neighboring macroblocks are checked and used to determine the mode of the current macroblock. Paragraphs 60-61 of Kondo discuss how the stored motion vectors are determined based on the mode used to encode the macroblock. The cited portion goes on to explain how the modes of the neighboring macroblocks are used in determining the mode and corresponding motion vector of the current macroblock. While the motion vector is not itself the macroblock mode, the method by which Kondo computes the motion vectors is determined according to the mode of the macroblock and the neighboring macroblocks.

Thus, Kondo teaches "checking the macroblock mode of at least one neighboring macroblock, and selecting the mode for the current macroblock in response to the macroblock mode of the at least one checked neighboring macroblock" as recited in claim 1.

Only one of the four recited steps of claim 1 need be taught by Kondo in order for Kondo to anticipate claim 1. Thus, the reasons set forth above with respect to the second step are sufficient to establish that Kondo fully anticipates claim 1.

Applicant argues [see page 18, line 17 to page 19, line 9 of Applicant's arguments] Kondo does not teach "checking the cost of a subset of macroblock modes, further checking only intra-coded modes if the checked cost meets a preset criteria, and selecting the mode for the current macroblock in response to the checked modes" as recited in claim 1. Applicant alleges Kondo does not check the cost of any macroblock mode.

Examiner replies that, during patent examination, the pending claims must be given their broadest reasonable interpretation consistent with the specification. See MPEP § 2111. "Cost" is very broad terminology. It is not required that Examiner apply only Applicant's particular definition of "cost" found in the specification. See MPEP § 2111.01(II) (it is improper to import claim limitations from the specification). In paragraph 60 of Kondo, the processing cost is determined based on the characteristics of the neighboring macroblocks. If all the neighboring macroblocks have no motion vector, then all the neighboring macroblocks are encoded using intra-coding modes, which results in the processing cost set forth in paragraph 60 of Kondo. Thus, the current macroblock is encoded with an intra-coding mode in response the fact that the neighboring macroblocks are all intra-coded, which carries the associated processing cost. Thus, Kondo teaches the third recited step.

Only one of the four recited steps of claim 1 need be taught by Kondo in order for Kondo to anticipate claim 1. Thus, the reasons set forth above with respect to the third step are sufficient to establish that Kondo fully anticipates claim 1.

Applicant argues [see page 19, line 10 to page 19, end of Applicant's arguments] Kondo does not apply an early-stopping threshold, and thus does not teach the fourth recited step.

Examiner replies, as discussed above, the broadest reasonable interpretation consistent with the specification is used in examining the pending claims. In paragraph 60 of Kondo, if a macroblock is an intra-coded macroblock, the motion vector is assumed to be zero. Thus, if all three of the macroblocks discussed therein are intra-coded or in direct mode, zero motion vector and intra-coding assumed. If two macroblocks are intra-coded or in direct mode, inter-coding is

used and the motion vector assumed to be equal to the motion vector of the remaining macroblock.

Thus, the early stopping threshold stops the checking of the macroblock modes if all three motion vectors are zero. Intra-coding is assumed and further mode checking is stopped at that point. However, if such is not the case, the early stopping threshold is adjusted so that, if two macroblocks are intra-coded or in direct mode, inter-coding is used and the motion vector assumed to be equal to the motion vector of the remaining macroblock. Further mode checking is stopped at that point.

Therefore, Kondo fully teaches "adjusting an early-stopping threshold in response to checked macroblock modes, and selecting the mode for the current macroblock in response to the checked macroblock modes if the adjusted early-stopping threshold is met" as recited in claim 1.

Only one of the four recited steps of claim 1 need be taught by Kondo in order for Kondo to anticipate claim 1. Thus, the reasons set forth above with respect to the fourth step are sufficient to establish that Kondo fully anticipates claim 1.

Applicant argues [see page 20, line 1 to page 21, line 4 of Applicant's arguments] Kondo does not teach claim 37. Applicant alleges Kondo teaches determining motion vectors, not macroblock modes or subsets of macroblock modes. Applicant further alleges Kondo does not teach comparing the subset of macroblock modes for coding efficiency, but rather uses all modes.

Examiner replies the specifically recited language of claim 37 is fully taught by Kondo. Again, Examiner respectfully reminds Applicant that, during patent examination, the pending

claims must be given their broadest reasonable interpretation consistent with the specification. See MPEP § 2111. Further, it is improper to import claim limitations from the specification. See MPEP § 2111.01(II).

Figures 3a-3d and paragraph 55 of Kondo demonstrates how the motion vector is to be calculated based on various combinations of motion vectors. In Kondo, the motion vectors are determined based on the macroblock mode to be encoded. For example, in paragraph 60 of Kondo, motion vectors and macroblock modes are determined based on assumptions regarding the relationships between motion vectors and whether the surrounding macroblocks are intra-coded or inter-coded. Paragraphs 60 and 63 of Kondo discusses comparing the modes so as to code in the most efficient manner based on the assumptions regarding motion vectors and coding modes. Depending on the determined relations, the most efficient mode is applied and the predicted vector is determined according to the applied assumptions. Thus, the macroblock mode is selected and the corresponding macroblock is encoded.

Applicant argues [see page 21, line 5 to page 22, line 12 of Applicant's arguments] Wang (US-2003/0099292) does not cure the alleged deficiencies of Kondo, and thus all of the claims are allegedly allowable over the prior art.

Examiner replies that, in Examiner's response above, Kondo has been shown to have been properly applied. Thus, the previous rejections are maintained.

Conclusion: The previous prior art rejections are maintained. Further, the prosecution history of the application has revealed additional issues with respect to 35 U.S.C. § 112, first and second paragraphs that need to be addressed. Additionally, in the interest of giving a full and fair hearing and developing a clear issue, as well as quickly advancing the prosecution of the

application (see MPEP § 706.07), Examiner provides additional prior art rejections which further demonstrate that all of the presently pending claims are either anticipated by the prior art or obvious to one of ordinary skill in the art at the time of the invention over the prior art.

4. The indication of potential allowability of claims 7, 8, 19, 20, 31 and 32 is withdrawn in view of the newly discovered reference to Kim (US-5,926,573). Rejections based on the newly cited references follow.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 1-36 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 1 recites a video encoding method comprising "at least one of:" a series of four macroblock mode selection steps. The language thus allows that two or more of the steps may occur during the execution of the method. However, the specification teaches each of the four steps separately and each step is sufficient in and of itself to perform the macroblock mode selection. Further, the specification only makes the bare mention that the steps can be applied jointly (page 9, lines 26-27 of Applicant's Specification).

There are no disclosed details which would enable one of ordinary skill in the art at the time of the invention to apply the steps jointly, nor would it have been apparent how such joint application could occur. For example, what criteria would one use to determine which of the four steps are to be applied for selecting the macroblock mode? Under which conditions would the method check first modes for a subset of macroblock modes? Under which conditions would the method check the macroblock mode of at least one neighboring macroblock? Under which conditions would the cost of a subset of macroblock modes be checked? Under which conditions would early-stopping threshold be adjusted and the current macroblock mode be selected in response to the checked macroblock modes? Applicant's disclosure does not explain this and it is not apparent how the four steps would be used jointly.

Apart from the mere mention of joint application of the four steps, the four steps are shown to operate independently of each other and fully select the mode for the current macroblock. Thus, claim 1 is not enabled by Applicant's disclosure.

Claims 2-12 each ultimately depend from claim 1, and thus incorporate all of the features of claim 1. Therefore, claims 2-12 are also not enabled by Applicant's disclosure.

Claim 13 recites a video encoder comprising "at least one of" four different "means" which correspond to the above mentioned four macroblock mode selection steps. Similarly, beyond the bare mention of joint application, Applicant's disclosure merely shows four independently operating means. Thus, for the reasons set forth above with respect to claim 1, claim 13 is not enabled by Applicant's disclosure.

Claims 14-24 each ultimately depend from claim 13, and thus incorporate all of the features of claim 13. Therefore, claims 14-24 are also not enabled by Applicant's disclosure.

Claim 25 recites a computer-readable non-transitory medium for performing the method of claim 1. Thus, claim 25 is not enabled by Applicant's disclosure for the reasons set forth above with respect to claim 1.

Claims 26-36 each ultimately depend from claim 25, and thus incorporate all of the features of claim 25. Therefore, claims 26-36 are also not enabled by Applicant's disclosure.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 1-36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites a video encoding method comprising "at least one of:" a series of four macroblock mode selection steps. The language thus allows that two or more of the steps may occur during the execution of the method. However, each step is sufficient in and of itself to select the macroblock mode. For example, if the first step is performed, the result is that the current macroblock mode is selected. If the second step were then to be performed, there would be a conflict as to which "current macroblock" is the real current macroblock. Such an ambiguity would occur for any combination of steps in which two or more of the four recited macroblock mode selection steps are performed. Thus, Applicant fails to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Claims 2-12 each ultimately depend from claim 1, and thus incorporate all of the features of claim 1. Therefore, claims 2-12 are also indefinite.

Claim 13 recites a video encoder comprising "at least one of" four different "means" which correspond to the above mentioned four macroblock mode selection steps. Thus, claim 13 is indefinite for the reasons set forth for claim 1.

Claims 14-26 each ultimately depend from claim 13, and thus incorporate all of the features of claim 13. Therefore, claims 14-26 are also indefinite. Further, claim 14 recites a "first-checking means" which performs the same recited function as the "first means" of claim 13. Are these meant to be separate means, or the same means? If separate means, how do they separately perform the same function? If same means, they should both be called either "first means" or "first-checking means". Similarly, claim 16 recites "neighbor-checking means" which performs the same function as the "macroblock means" of claim 13; claim 17 recites "intra-checking means" which performs the same function as the "subset means" of claim 13; and claim 18 recites "thresholding means" which performs the same function as the "stopping means" of claim 13. Therefore Applicant, for these additional reasons, has failed to particularly point out and distinctly claim the subject matter Applicant regards as the invention in claims 14, 16, 17 and 18.

Claim 25 recites a computer-readable non-transitory medium for performing the method of claim 1. Thus, claim 25 is indefinite for the reasons set forth for claim 1.

Claims 26-36 each ultimately depend from claim 25, and thus incorporate all of the features of claim 25. Therefore, claims 26-36 are also indefinite.

BASES OF PRIOR ART REJECTIONS

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

FIRST SET OF PRIOR ART REJECTIONS

11. Claims 1, 2, 4-6, 9-14, 16-18, 21-26, 28-30 and 33-37 are rejected under 35 U.S.C. 102(e) as being anticipated by Kondo (US-2004/0218674).

Regarding claims 1, 13 and 25: Kondo discloses in a video encoder having a processor, a video encoding method for encoding a current macroblock of an inter-coded frame **(fig. 1 and para. 49, lines 1-11 of Kondo)**, the method comprising at least one of:

checking first modes for a subset of macroblock modes (**para. 46-47 of Kondo**), selectively checking other modes in response to motion vector information of the checked first modes (**para. 48 of Kondo**), and selecting the mode for the current macroblock in response to the checked modes (**para. 49, lines 1-11 of Kondo**);

checking the macroblock mode of at least one neighboring macroblock (**paras. 53-54 and para. 57, lines 1-4 of Kondo**), and selecting the mode for the current macroblock in response to the macroblock mode of the at least one checked neighboring macroblock (**paras. 60-61 of Kondo**);

checking the cost of a subset of macroblock modes (**para. 60 of Kondo** - processing cost determined based on characteristics of neighboring macroblocks), further checking only intra-coded modes if the checked cost meets a preset criteria (**para. 60, lines 8-11 of Kondo**), and selecting the mode for the current macroblock in response to the checked modes (**para. 63, lines 1-6 of Kondo**); and

adjusting an early-stopping threshold in response to checked macroblock modes, and selecting the mode for the current macroblock in response to the checked macroblock modes if the adjusted early-stopping threshold is met (**para. 60 of Kondo** – if macroblock is intra-coded macroblock, motion vector is assumed to be zero; if all three are intra-coded or in direct mode, zero motion vector and intra-coding assumed; if two are intra-coded or in direct mode, inter-coding is used and motion vector assumed to be equal to motion vector of remaining macroblock),

wherein the method further comprises encoding the current macroblock using the selected mode for the current macroblock (**para. 50 of Kondo**).

Further regarding claim 13: The method of claim 1 is implemented by a video encoder **(fig. 1 of Kondo)**.

Further regarding claim 25: The method of claim 1 is implemented via a computer-readable non-transitory medium **(para. 126, lines 14-17 of Kondo)**.

Regarding claims 2, 14 and 26: Kondo discloses checking first modes for a subset of macroblock modes **(para. 46-47 of Kondo)**, selectively checking other modes in response to motion vector information of the checked first modes **(para. 48 of Kondo)**, and selecting the mode for the current macroblock in response to the checked modes **(para. 49, lines 1-11 of Kondo)**.

Regarding claims 4, 16 and 28: Kondo discloses checking the macroblock mode of at least one neighboring macroblock **(paras. 53-54 and para. 57, lines 1-4 of Kondo)**, and selecting the mode for the current macroblock in response to the macroblock mode of the at least one checked neighboring macroblock **(paras. 60-61 of Kondo)**.

Regarding claims 5, 17 and 29: Kondo discloses checking the cost of a subset of macroblock modes **(para. 60 of Kondo** - processing cost determined based on characteristics of neighboring macroblocks), further checking only intra-coded modes if the checked cost meets a preset criteria **(para. 60, lines 8-11 of Kondo)**, and selecting the mode for the current macroblock in response to the checked modes **(para. 63, lines 1-6 of Kondo)**.

Regarding claims 6, 18 and 30: Kondo discloses adjusting an early-stopping threshold in response to checked macroblock modes, and selecting the mode for the current macroblock in response to the checked macroblock modes if the adjusted early-stopping threshold is met **(para. 60 of Kondo** – if macroblock is intra-coded macroblock, motion vector is assumed to be zero; if

all three are intra-coded or in direct mode, zero motion vector and intra-coding assumed; if two are intra-coded or in direct mode, inter-coding is used and motion vector assumed to be equal to motion vector of remaining macroblock).

Regarding claims 9, 21 and 33: Kondo discloses wherein spatial/temporal neighboring macroblock and block partition information is used to decide the subset of possible block sizes or inter/intra modes that need to be checked **(figs. 3a-3d and para. 60 of Kondo)**.

Regarding claims 10, 22 and 34: Kondo discloses initially performing mode checking for a subset of both inter modes and intra modes **(para. 60 of Kondo)**;

calculating a complexity measure responsive to the mode checking **(para. 60, lines 4-11 of Kondo)**; and

using the complexity measure to determine if other inter modes and intra modes should be performed **(para. 63 of Kondo)**.

Regarding claims 11, 23 and 35: Kondo discloses wherein the early stop criteria are based on adaptive thresholding to stop checking other inter or intra modes **(para. 60, lines 4-11 of Kondo** – motion vectors for mode determination are computed based on whether the neighbor macroblock should be checked**)**.

Regarding claims 12, 24 and 36: Kondo discloses wherein early termination takes place if spatially or/and temporally neighboring macroblocks have a specific relationship with the motion information of the current macroblock after examining a specific mode **(para. 60, lines 4-11 of Kondo** – if intra-coded macroblock, motion vector is assumed to be zero and no further examination is performed**)**.

Regarding claim 37: Kondo discloses in a video encoder having a processor, a video encoding method for encoding a macroblock of an inter-coded frame **(fig. 1 and para. 49, lines 1-11 of Kondo)**, the method comprising:

selecting a subset of macroblock modes for encoding **(figs. 3a-3d and para. 55 of Kondo)**;

comparing said subset of macroblock modes for coding efficiency **(paras. 60 and 63 of Kondo** – inter/intra coding and motion vectors to be computed are determined using the macroblock modes of neighboring macroblocks based on assumptions regarding the motion vectors);

selecting a mode having favorable coding efficiency, responsive to said step of comparing modes **(para. 57, lines 1-4; para. 58, lines 1-4; para. 59, lines 1-5; and para. 64 of Kondo)**; and

encoding the macroblock using the selected mode **(para. 50 of Kondo)**.

12. Claims 3, 15 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kondo (US-2004/0218674) in view of Wang (US-2003/0099292).

Regarding claims 3, 15 and 27: Kondo does not disclose expressly wherein said first modes comprise the quadratic modes of SKIP, 16x16, 8x8, and 4x4.

Wang discloses wherein said first modes comprise the quadratic modes of SKIP (para. 97 of Wang), 16x16, 8x8, and 4x4 (figs. 3a-3f and para. 57-58 of Wang).

Kondo and Wang are combinable because they are from the same field of endeavor, namely digital video data encoding. At the time of the invention, it would have been obvious to

a person of ordinary skill in the art to use the quadratic modes of SKIP, 16x16, 8x8, and 4x4, as taught by Wang. The suggestion for doing so would have been that the modes are commonly used modes for macroblock encoding. Therefore, it would have been obvious to combine Wang with Kondo to obtain the invention as specified in claims 3, 15 and 27.

13. Claims 7, 8, 19, 20, 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kondo (US-2004/0218674) in view of Kim (US-5,926,573).

Regarding claims 7, 19 and 31: Kondo does not disclose expressly initially performing motion estimation only for a subset of the possible block sizes; and using the motion information to determine if other motion estimation or complexity measures should be performed for other block sizes.

Kim discloses initially performing motion estimation **(column 4, lines 63-67 of Kim)** only for a subset of the possible block sizes; and using the motion information to determine if other motion estimation or complexity measures should be performed for other block sizes **(fig. 2 and column 3, lines 37-46 of Kim** – The original macroblock modes are checked first to determine if the mode is appropriate for recoding. If not, then and only then are additional macroblock modes checked. Intra versus inter coding uses different sizes, as do the different inter-coding macroblock modes.).

Kondo and Kim are analogous art because they are from the same field of endeavor, namely digital video data encoding. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to initially perform motion estimation only for a subset of the possible block sizes, and use the motion information to determine if other motion estimation or

complexity measures should be performed for other block sizes, as taught by Kim. The motivation for doing so would have been to improve the overall encoding efficiency. Therefore, it would have been obvious to combine Kim with Kondo to obtain the invention as specified in claims 7, 19 and 31.

Regarding claims 8, 20 and 32: Kondo does not disclose expressly wherein said first modes are checked first and their motion information is used to decide if other modes needs to be checked.

Kim discloses wherein said first modes are checked first and their motion information is used to decide if other modes needs to be checked **(fig. 2 and column 3, lines 37-46 of Kim)**.

Kondo and Kim are analogous art because they are from the same field of endeavor, namely digital video data encoding. At the time of the invention, it would have been obvious to check said first modes first and use their motion information to decide if other modes need to be checked, as taught by Kim. The motivation for doing so would have been to improve the overall encoding efficiency. Therefore, it would have been obvious to combine Kim with Kondo to obtain the invention as specified in claims 8, 20 and 32.

SECOND SET OF PRIOR ART REJECTIONS

14. Claims 1, 2, 4-6, 9-14, 16-18, 21-26, 28-30 and 33-37 are rejected under 35 U.S.C. 102(b) as being anticipated by Wiegand ("Rate Distortion Optimized Mode Selection for Very Low Bit Rate Video Coding and the Emerging H.263 Standard," by Thomas Wiegand, Michael Lightstone, Debargha Mukherjee, T. George Campbell, and

Sanjit K. Mitra, IEEE Transactions on Circuits and Systems for Video Technology, April 1996, pages 182-190).

Regarding claims 1, 13 and 25: Wiegand discloses a video encoder having a processor **(page 182, left column, lines 1-2 after "Introduction" of Wiegand)** for encoding a current macroblock of an inter-coded frame **(page 182, right column, lines 13-15 of Wiegand)**, the encoder comprising the processor **(page 183, left column, lines 3-6 of Wiegand** – some form of processor required to process digital video data) and at least one of:

first means for checking the first modes for a subset of macroblock modes, selectively checking other modes in response to motion vector information of the checked first modes, and selecting the mode for the current macroblock in response to the checked modes **(page 184, left column, lines 6-34 of Wiegand [line 6 to fifteen lines past equation 6]** – macroblock modes used in the selection are limited based on distortion and motion vector information);

macroblock means for checking the macroblock mode of at least one neighboring macroblock, and selecting the mode for the current macroblock in response to the macroblock mode of the at least one checked neighboring macroblock **(page 184, left column, lines 6-34 of Wiegand [line 6 to fifteen lines past equation 6]** – macroblock modes used in the selection are limited not only based on the current mode, but also on the modes of adjacent macroblocks);

subset means for checking the cost of a subset of macroblock modes, further checking only intra-coded modes if the checked cost meets a preset criteria, and selecting the mode for the current macroblock in response to the checked modes **(page 183, right column, lines 2-7; and page 184, left column, lines 6-21 of Wiegand [line 6 to two lines past equation 6] of Wiegand)**; and

stopping means for adjusting an early-stopping threshold in response to checked macroblock modes, and selecting the mode for the current macroblock in response to the checked macroblock modes if the adjusted early-stopping threshold is met (**Sections B and C on pages 184-185 of Wiegand** – limiting [stopping] condition adjusted, and the mode switching optimized, based on the determined Lagrange multiplier),

wherein the encoder further comprises means for encoding the current macroblock using the selected mode for the current macroblock (**page 183, left column, lines 3-6 of Wiegand**).

Further regarding claim 1: The encoder of claim 13 performs the method of claim 1.

Further regarding claim 25: The method of claim 1 is implemented via a computer-readable non-transitory medium (**page 185, first paragraph under Section A in Wiegand**).

Regarding claims 2, 14 and 26: Wiegand discloses first-checking means for checking first modes for a subset of macroblock modes, selectively checking other modes in response to motion vector information of the checked first modes, and selecting the mode for the current macroblock in response to the checked modes (**page 184, left column, lines 6-34 of Wiegand [line 6 to fifteen lines past equation 6]** – macroblock modes used in the selection are limited based on distortion and motion vector information).

Regarding claims 4, 16 and 28: Wiegand discloses neighbor-checking means for checking the macroblock mode of at least one neighboring macroblock, and selecting the mode for the current macroblock in response to the macroblock mode of the at least one checked neighboring macroblock (**page 184, left column, lines 6-34 of Wiegand [line 6 to fifteen lines past equation 6]** – macroblock modes used in the selection are limited not only based on the current mode, but also on the modes of adjacent macroblocks).

Regarding claims 5, 17 and 29: Wiegand discloses comprising intra-checking means for checking the cost of a subset of macroblock modes, further checking only intra-coded modes if the checked cost meets a preset criteria, and selecting the mode for the current macroblock in response to the checked modes **(page 183, right column, lines 2-7; and page 184, left column, lines 6-21 of Wiegand [line 6 to two lines past equation 6] of Wiegand)**.

Regarding claims 6, 18 and 30: Wiegand discloses comprising thresholding means for adjusting an early-stopping threshold in response to checked macroblock modes, and selecting the mode for the current macroblock in response to the checked macroblock modes if the adjusted early-stopping threshold is met **(Sections B and C on pages 184-185 of Wiegand** – limiting [stopping] condition adjusted, and the mode switching optimized, based on the determined Lagrange multiplier).

Regarding claims 9, 21 and 33: Wiegand discloses wherein spatial/temporal neighboring macroblock and block partition information is used to decide the subset of possible block sizes or inter/intra modes that need to be checked **(page 183, left column, line 57 to right column, line 5; and page 184, left column, lines 6-34 of Wiegand [line 6 to fifteen lines past equation 6]** – intra/inter frame encoding and macroblock modes used are based on the current mode and on the modes of adjacent macroblocks).

Regarding claims 10, 22 and 34: Wiegand discloses inter/intra checking means for initially performing mode checking for a subset of both inter modes and intra modes **(page 183, left column, line 55 to page 184, left column, line 21 of Wiegand** – macroblock modes initially limited based on computed criteria, as further shown in figure 1);

complexity means for calculating a complexity measure responsive to the mode checking **(pages 184-185, Sections B["Lagrange Multiplier Determination"] & C["Parameter Optimization"] of Wiegand)**; and

inter/intra determination means for using the complexity measure to determine if other inter modes and intra modes should be performed **(page 185, right column, line 4 to page 185, right column, end of Section C of Wiegand** – optimized cost function used to determine which modes should be checked and/or utilized).

Regarding claims 11, 23 and 35: Wiegand discloses wherein the early stop criteria are based on adaptive thresholding to stop checking other inter or intra modes **(page 185, right column, line 4 to page 185, right column, end of Section C of Wiegand** – cost parameters are optimized [adaptive thresholding] to determine where to narrowly search for modes, and thus where to stop checking modes).

Regarding claims 12, 24 and 36: Wiegand discloses wherein early termination takes place if spatially or/and temporally neighboring macroblocks have a specific relationship with the motion information of the current macroblock after examining a specific mode **(page 184, left column, lines 6-34; and page 185, right column, line 4 to page 185, right column, end of Section C of Wiegand** – modes searched limited based on cost parameters, which include neighboring macroblocks).

Regarding claim 37: Wiegand discloses, in a video encoder having a processor **(page 182, left column, lines 1-2 after "Introduction" of Wiegand)**, a video encoding method for encoding a macroblock of an inter-coded frame **(page 182, right column, lines 13-15 of Wiegand)**, the method comprising:

selecting a subset of macroblock modes for encoding (**page 184, left column, lines 6-34 of Wiegand [line 6 to fifteen lines past equation 6]** – macroblock modes used in the selection are limited based on distortion and motion vector information);

comparing said subset of macroblock modes for coding efficiency (**page 184, left column, line 35 to right column, end of Section A of Wiegand** – macroblock modes which do not follow along optimal path are considered to be less efficient);

selecting a mode having favorable coding efficiency, responsive to said step of comparing modes (**page 185, right column, line 4 to page 185, right column, end of Section C of Wiegand** – optimized cost function used to determine which modes should be used); and

encoding the macroblock using the selected mode (**page 183, left column, lines 3-6 of Wiegand**).

15. Claims 3, 15 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wiegand ("Rate Distortion Optimized Mode Selection for Very Low Bit Rate Video Coding and the Emerging H.263 Standard," by Thomas Wiegand, Michael Lightstone, Debargha Mukherjee, T. George Campbell, and Sanjit K. Mitra, IEEE Transactions on Circuits and Systems for Video Technology, April 1996, pages 182-190) in view of Wang (US-2003/0099292).

Regarding claims 3, 15 and 27: Wiegand does not disclose expressly wherein said first modes comprise the quadratic modes of SKIP, 16x16, 8x8, and 4x4.

Wang discloses wherein said first modes comprise the quadratic modes of SKIP (para. 97 of Wang), 16x16, 8x8, and 4x4 (figs. 3a-3f and para. 57-58 of Wang).

Wiegand and Wang are combinable because they are from the same field of endeavor, namely digital video data encoding. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the quadratic modes of SKIP, 16x16, 8x8, and 4x4, as taught by Wang. The suggestion for doing so would have been that the modes are commonly used modes for macroblock encoding. Therefore, it would have been obvious to combine Wang with Wiegand to obtain the invention as specified in claims 3, 15 and 27.

16. Claims 7, 8, 19, 20, 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wiegand ("Rate Distortion Optimized Mode Selection for Very Low Bit Rate Video Coding and the Emerging H.263 Standard," by Thomas Wiegand, Michael Lightstone, Debargha Mukherjee, T. George Campbell, and Sanjit K. Mitra, IEEE Transactions on Circuits and Systems for Video Technology, April 1996, pages 182-190) in view of Kim (US-5,926,573).

Regarding claims 7, 19 and 31: Wiegand does not disclose expressly initially performing motion estimation only for a subset of the possible block sizes; and using the motion information to determine if other motion estimation or complexity measures should be performed for other block sizes.

Kim discloses initially performing motion estimation **(column 4, lines 63-67 of Kim)** only for a subset of the possible block sizes; and using the motion information to determine if other motion estimation or complexity measures should be performed for other block sizes **(fig. 2 and column 3, lines 37-46 of Kim** – The original macroblock modes are checked first to determine if the mode is appropriate for recoding. If not, then and only then are additional

macroblock modes checked. Intra versus inter coding uses different sizes, as do the different inter-coding macroblock modes.).

Wiegand and Kim are analogous art because they are from the same field of endeavor, namely digital video data encoding. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to initially perform motion estimation only for a subset of the possible block sizes, and use the motion information to determine if other motion estimation or complexity measures should be performed for other block sizes, as taught by Kim. The motivation for doing so would have been to improve the overall encoding efficiency. Therefore, it would have been obvious to combine Kim with Wiegand to obtain the invention as specified in claims 7, 19 and 31.

Regarding claims 8, 20 and 32: Wiegand does not disclose expressly wherein said first modes are checked first and their motion information is used to decide if other modes needs to be checked.

Kim discloses wherein said first modes are checked first and their motion information is used to decide if other modes needs to be checked **(fig. 2 and column 3, lines 37-46 of Kim)**.

Wiegand and Kim are analogous art because they are from the same field of endeavor, namely digital video data encoding. At the time of the invention, it would have been obvious to check said first modes first and use their motion information to decide if other modes need to be checked, as taught by Kim. The motivation for doing so would have been to improve the overall encoding efficiency. Therefore, it would have been obvious to combine Kim with Wiegand to obtain the invention as specified in claims 8, 20 and 32.

Conclusion

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. "MPEG Coding Performance Improvement by Jointly Optimizing Code Mode Decisions and Rate Control" by Huifang Sun, Wilson Kwak, Max Chien, and C.H. John Ju, IEEE Transactions on Circuits and Systems for Video Technology, June 1997, pages 449-458.

b. "Efficient RD Optimized Macroblock Coding Mode Selection MPEG-2 Video Coding" by Yuen-Wen Lee, Faouzi Kossentini, and Rabab Ward, Proceedings of the International Conference On Image Processing, October 1997, pages 803-806.

c. Chujoh et al., US-2003/0007692, Published 09 January 2003.

d. Etoh et al., US-2005/0063466, Published 24 March 2005, Filed 29 November 2002.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Thompson whose telephone number is (571)272-7441. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman can be reached on 571-272-7653. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/James A Thompson/
Primary Examiner, Art Unit 2625

12 April 2011